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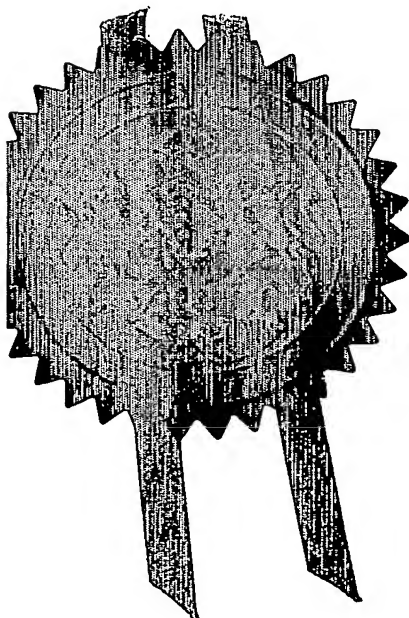
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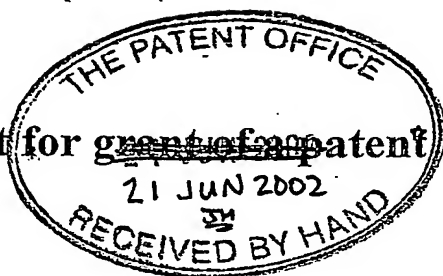
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Dated 23 May 2003

Request for grant of a patent



24JUN02 E727847-5 D00389
P01/7700 0.00-071478 Patent Office

Concept House
Cardiff Road
Newport
South Wales, NP10 8QQ

1. Your reference P16460GB - NHF/NGJ/szl
2. Patent application number
(The Patent Office will fill in this part) 0214396.4 21 JUN 2002
3. Full name, address and postcode of the or of each applicant *(underline all surnames)* Autoliv Development AB,
Patent Department Sweden,
S-447 83 VARGADA,
Sweden.

 Patents ADP number *(if you know it)* 321018009

 If the applicant is a corporate body, give the country/state of its incorporation Sweden
4. Title of the invention "Improvements in or relating to an Air-Bag"
5. Name of your agent *(if you have one)* Forrester Ketley & Co.

 "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)* Forrester House
52 Bounds Green Road
London N11 2EY

 Patents ADP number *(if you know it)* 133001 ✓
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number <i>(if you know it)</i>	Date of filing <i>(day/month/year)</i>
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing <i>(day/month/year)</i>
8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer "Yes" if:*
 a) *any applicant named in part 3 is not an inventor, or*
 b) *there is an inventor who is not named as an applicant, or*
 c) *any named applicant is a corporate body.*
See note (d))
YES

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Continuation sheets of this form -

Description 11

Claim(s) 4

Abstract 1

Drawing(s) 3+3

10. If you are also filing any of the following, state how many against each item.

Priority documents NONE

Translation of priority documents -

Statement of inventorship and right to grant of a patent (Patents Form 7/77) -

Request for preliminary examination and search (Patents Form 9/77) YES, ONE

Request for substantive examination (Patents Form 10/77) -

Any other documents (please specify) -

11. I/We request the grant of a patent based on the basis of this application

Signature


Forrester Ketley & Co.

Date

20 June, 2002

12. Name and daytime telephone number of person to contact in the United Kingdom FRANKLAND, Nigel H. (020) 8889 6622

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PATENTS ACT 1977

P16460GB - NHF/NGJ/szl

"IMPROVEMENTS IN OR RELATING TO AN AIR-BAG"

THE PRESENT INVENTION relates to an air-bag.

It has been proposed to provide an air-bag which has a plurality of inflatable regions or chambers which are to be supplied with gas from a gas generator. One example of such an air-bag is a so-called "inflatable curtain" which is adapted to be mounted in the roof line of the vehicle above the door openings of the vehicle, and which is also adapted, when an accident occurs, to be deployed to lie adjacent to the window openings formed in the door, thus forming a protective curtain located between the occupants of the vehicle and the side of the vehicle. Such inflatable curtains are intended to provide protection to the occupants of the vehicle in the event of a side impact or roll-over situation.

Inflatable curtains must be inflated very quickly, necessitating a high gas flow rate into the bag. The forces generated by this very high gas flow rate may cause the bag to tear. Continued inflation may result in the tear propagating, therefore degrading the performance characteristic of the air-bag. Certain areas of the air-bag have been found to be more prone to tearing than others, and in certain air-bag designs it has been found that even adding extra stitching does not result in the avoidance of such tearing.

The invention seeks to provide an improved air-bag.

According to the present invention, there is provided an air-bag comprising an inflatable element having an inflatable region and a gas inlet throat extending from the inflatable region, a gusset of excess fabric being present in the region proximate to the junction between the gas inlet throat and the inflatable region.

Preferably, the inflatable region and the gas inlet throat each have at least two side edges, one side edge of the gas inlet throat being substantially aligned with one side of the inflatable region, the other side edge of the gas inlet throat being substantially perpendicular to another side edge of the inflatable region, said gusset being located adjacent the junction of the said other side edge of the gas inlet throat and said another side edge of the inflatable region.

Conveniently, the gusset is formed integrally with the air-bag.

Advantageously, the inflatable region has a gas flow passage formed within it, said gas flow passage defining a first axis, and said gas inlet throat defines a second axis, the air-bag having a first and a second configuration, the axis of the gas flow passage and the axis of the gas inlet throat defining an oblique angle therebetween in the first configuration, the two axes being co-aligned and said gusset of excess fabric being present in the region proximate to the junction between the gas inlet throat and the inflatable region in the second configuration.

Preferably, the inflatable region incorporates a plurality of cells defined by seams in the air-bag, the cells communicating with the gas flow passage.

Conveniently, straps extend from spaced apart points on the inflatable region, each strap having a free end adapted to be secured to a respective anchoring point formed on the interior of a vehicle.

Advantageously, the air-bag is formed from woven fabric.

Preferably, the woven fabric has warp and weft yarns, the axis defined by the gas flow passage being aligned with either the warp yarns or the weft yarns of the woven fabric, and the axis defined by the gas inlet throat being inclined at said oblique angle relative to either the warp yarns or the weft yarns of the fabric.

Conveniently, said oblique angle is between 10 and 20 degrees.

Advantageously, said oblique angle is 15 degrees.

The invention further provides for a method for processing an air-bag for mounting in a vehicle, the air-bag comprising an inflatable element having an inflatable region and a gas inlet throat, said inflatable region having at least two side edges, and having a gas flow passage formed within it, said gas flow passage defining a first axis; said gas inlet throat having two side edges, said gas inlet throat defining a second axis, the gas inlet throat extending from a corner defined by the junction of said two side edges of the inflatable region, the method comprising the step of re-positioning the gas inlet throat from a first condition in which the axis defined by said gas inlet throat is inclined relative to the axis defined by the gas flow passage to a second condition in which the axis defined by the gas inlet throat is aligned with the axis defined by the gas flow passage, thereby forming a gusset of excess material, said gusset being located

adjacent the junction of one of said side edges of the gas inlet throat and one of said side edges of the inflatable region.

Preferably, the method further comprises the step of concertina-folding the inflatable region.

Conveniently, the concertina folds are parallel to the axis defined by the gas flow passage of the inflatable region.

Advantageously, the method further comprises the step of encasing the air-bag in a sleeve or housing.

Preferably, the method further comprises the step of locating parts of the air-bag to extend through apertures formed in the sleeve or housing such that said parts protrude from the sleeve or housing.

Conveniently, the method further comprises the step of connecting the gas inlet throat to a gas generator.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic side view of a prior art air-bag of the inflatable curtain type connected to a gas generator and sensor arrangement,

FIGURE 2 is a diagrammatic side view of a presently preferred embodiment of an air-bag of the invention,

FIGURE 3 is an enlarged diagrammatic side view of a region of the air-bag of Figure 2 shown in the first stage of preparation for mounting in a vehicle, and

FIGURE 4 is a diagrammatic side view of the air-bag of Figure 2 in the final stage of preparation for mounting in a vehicle connected to a gas generator and sensor arrangement.

The prior art air-bag 2 of Figure 1 is formed from two superimposed layers of fabric, each layer of fabric having the same outer peripheral shape. The two layers of fabric may be secured together to form seams by stitching. Alternatively, the entire bag may be constructed using a one piece weaving technique, familiar to those skilled in the art, in which the seams are integrally woven into the bag.

The inflatable curtain has a substantially rectangular main inflatable region 4, defined by four side edges: an upper side edge 6, lower side edge 8 and two opposed side edges 10 and 12. The upper and lower side edges 6, 8 are longer than the two opposed side edges 10, 12.

A plurality of mounting tabs 14 extend from the upper side edge 6 of the air-bag. Each of the mounting tabs 14 has a hole 16 formed therethrough to facilitate the mounting of the air-bag in a vehicle. The mounting tabs 14 are evenly spaced along the upper side edge 6 of the substantially rectangular main inflatable region of the air-bag.

A projecting portion 18 is formed at one end of the substantially rectangular main inflatable region 4, and extends from an upper corner of the

region 4 in a direction parallel to the upper side edge 6 of the air-bag and perpendicular to a side edge 12 of the air-bag. The projecting portion 18 is formed from the fabric used to form the main inflatable region 4 and thus the air-bag is formed integrally.

The projecting portion 18 defines a substantially rectangular shaped gas inlet throat 20 formed between an upper side edge 21 and lower side edge 23. The upper side edge 21 and the lower side edge 23 of the gas inlet throat are each constituted by a respective seam 22, 24. The gas inlet throat 20 is linear and defines a first axis. One end 25 of the gas inlet throat 20 which is remote from the rectangular region of the air-bag is connected to a gas generator 26. This gas generator is connected to a collision and roll-over sensor 27. The other end of the gas inlet throat 20 communicates with a gas flow passage 28 formed in the interior of the rectangular main inflatable region 4 of the air-bag. The gas flow passage 28 is generally linear and runs along the top of the air-bag adjacent to the upper side edge 6. The gas flow passage 28 defines a second axis. The axis of the gas inlet throat 20 and the axis of the gas flow passage 28 are co-aligned.

A plurality of vertically extending seams 30 define a row of inflatable cells 32, each cell having a substantially vertical axis which intersects the lower edge 8 of the rectangular region of the air-bag. The top of each of the cells 32 communicates with the gas flow passage 28. When inflated, these cells 32 adopt a substantially cylindrical profile.

A pair of straps 34, 36 extend from two spaced apart points on the lower side edge 8 of the air-bag. Each strap has a free end which is adapted to be secured or mounted to a respective anchoring point formed on the interior of a vehicle in which the air-bag is to be mounted.

In the event that the vehicle in which the air-bag 2 is mounted is involved in a side-impact collision or a rollover, the sensor 27 generates a signal which is sent to the gas generator 26, causing the gas generator to generate and discharge gas. The gas flows through the gas inlet throat 20 and along the gas flow passage 28 and hence into the cells 32, which are inflated.

As the cells inflate, they adopt a substantially cylindrical profile, resulting in the lower edge of the bag 8 decreasing in length. This reduction in length creates a line of tension between the anchoring points to which the straps 34, 36 are secured which acts to hold the bag in place. The substantially vertical axes of the cells 32 intersect this line of tension.

It has been found that tearing may occur in the throat region of this type of air-bag. In particular tearing has been found to occur in the region 'A' shown in Figure 1, that is, in the region between the lower side edge 23 of the gas inlet throat 20 and the side edge 12 of the air-bag from which the gas inlet throat 20 extends.

Turning to Figure 2, a presently preferred embodiment of an air-bag according to the invention is illustrated in a first configuration. The basic design of the air-bag is very similar to that of Figure 1. Thus like parts have been given like references and will not be re-described in detail.

In the embodiment of Figure 2 the air-bag in the first configuration is flat and the gas inlet throat 20 is not co-aligned with the gas flow passage 28, but is inclined upwardly above the upper side edge 6 of the air-bag.

The axes defined by the gas inlet throat 20 and the gas flow passage 28 are not co-aligned, but are at an oblique angle relative to each other. An oblique (as opposed to a right) angle is formed in the area A between the lower side edge 23 of the gas inlet throat 20 and the side edge of the air-bag 12. The preferred angle between the axis of the gas inlet throat 20 and the axis of the gas flow passage 28 is in the range of 10 to 20 degrees, the most preferred angle being 15 degrees°.

The upper, lower and opposed side edges of the rectangular region 4 of the air-bag, together with the seams 30 formed in the air-bag and the axis defined by the gas flow passage 20 align with either the warp or the weft yarns of the fabric (shown at region B) from which the bag is made, and are thus perpendicular to the other of either the warp or weft yarns.

The axis of the gas inlet throat 20 defines respective oblique angles relative to both the warp and weft yarns of the fabric, shown at region C.

In processing the air-bag of Figure 2 for mounting in a vehicle, the air-bag is initially in the configuration as shown in and described with reference to Figure 2. Subsequently, the gas inlet throat 20 is re-positioned so that the axis of the gas inlet throat 20 and the axis of the gas flow passage 28 are co-aligned, so that the air-bag has a second configuration as shown in Figure 3. Correspondingly, a right angle is created between the lower side edge 23 of the gas inlet throat 20 and the side edge 12 of the rectangular main inflatable region of the air-bag.

Thus, the air-bag of Figure 3 is configured to have substantially the same overall configuration as the air-bag of Figure 1, and it may readily be mounted

in a vehicle in the same manner as the air bag shown in and described with reference to Figure 1.

As a result of the re-positioning of the gas inlet throat 20, with its axis aligned with that of the gas flow passage 28, a wrinkled region or gusset 38 of excess fabric is formed along the lower edge 23 of the gas inlet throat where it joins the rectangular main inflatable region 4 of the air-bag.

The air-bag may be attached to a gas generator 40 which in turn may be connected to a collision and roll-over sensor 42, as shown in Figure 4. The air-bag may be folded in a concertina manner with folds parallel to the axis defined by the gas flow passage. The folded air-bag is encased within a sleeve 44 or a housing. A plurality of mounting tabs 14 extend through and protrude from apertures formed in the upper side edge of the sleeve or housing, and the straps 34, 36 extend from the air-bag and protrude through the ends of the sleeve 44 or housing.

The mounting tabs 14 may be mounted by the holes 16 therein to anchoring points within the roof line of a vehicle, and straps 34 and 36 may be secured to respective anchoring points within the vehicle, which are preferably on the A and C posts of the vehicle, or alternatively on the A and B posts of the vehicle.

In the event that the vehicle in which the air-bag is mounted is involved in a side-impact collision or a roll-over, the sensor 42 triggers the gas generator 40 to generate gas which is subsequently passed through the gas inlet throat 20 and into the gas flow passage 28 of the air-bag.

The gas will flow initially into the gas flow passage 28 of the air-bag and subsequently into the cells 32.

As the gas flows into the cells 32 the air-bag inflates to occupy a position beneath the sleeve 44 or housing. The individual cells 32 of the air-bag inflate, and the lower edge 8 of the air-bag decreases in length, creating a line of tension between the anchoring points to which the straps 34, 36 are attached.

It has been found that, due to the excess fabric, the wrinkled region or gusset 38 is not particularly susceptible to tearing. The presence of this gusset 38 increases the ability of the fabric to elongate thus distributing the load applied across a greater area of material and to a greater amount of warp and weft strands.

Furthermore, a buffer zone is provided by the gusset 38 which acts to absorb the force applied by gas on inflation of the air-bag and minimise the risk of tearing.

It is also believed that an angle or corner, such as the angle or corner between the lower side edge 23 of the gas inlet throat 20 and the side edge 12 of the air-bag is intrinsically stronger if one of the elements defining the angle or corner is at an oblique angle to the warp or weft yarns.

In the present Specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process

for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. An air-bag comprising an inflatable element having an inflatable region and a gas inlet throat extending from the inflatable region, a gusset of excess fabric being present in the region proximate to the junction between the gas inlet throat and the inflatable region.
2. An air-bag according to Claim 1, wherein the inflatable region and the gas inlet throat each have at least two side edges, one side edge of the gas inlet throat being substantially aligned with one side of the inflatable region, the other side edge of the gas inlet throat being substantially perpendicular to another side edge of the inflatable region, said gusset being located adjacent the junction of the said other side edge of the gas inlet throat and said another side edge of the inflatable region.
3. An air-bag according to Claim 1 or Claim 2, wherein the gusset is formed integrally with the air-bag.
4. An air-bag according to any one of Claims 1 to 3, wherein the inflatable region has a gas flow passage formed within it, said gas flow passage defining a first axis, and said gas inlet throat defines a second axis, the air-bag having a first and a second configuration, the axis of the gas flow passage and the axis of the gas inlet throat defining an oblique angle therebetween in the first configuration, the two axes being co-aligned and said gusset of excess fabric being present in the region proximate to the junction between the gas inlet throat and the inflatable region in the second configuration.

5. An air-bag according to Claim 4, wherein the inflatable region incorporates a plurality of cells defined by seams in the air-bag, the cells communicating with the gas flow passage.

6. An air-bag according to Claim 5, wherein straps extend from spaced apart points on the inflatable region, each strap having a free end adapted to be secured to a respective anchoring point formed on the interior of a vehicle.

7. An air-bag according to any one of the preceding Claims, wherein the air-bag is formed from woven fabric.

8. An air-bag according to Claim 7 as dependent on any one of Claims 4 to 6, wherein the woven fabric has warp and weft yarns, the axis defined by the gas flow passage being aligned with either the warp yarns or the weft yarns of the woven fabric, and the axis defined by the gas inlet throat being inclined at said oblique angle relative to either the warp yarns or the weft yarns of the fabric.

9. An air-bag according to Claim 4 or any claim dependent thereon wherein said oblique angle is between 10 and 20 degrees.

10. An air-bag according to Claim 9, wherein said oblique angle is 15 degrees.

11. A method for processing an air-bag for mounting in a vehicle, the air-bag comprising an inflatable element having an inflatable region and a gas inlet throat, said inflatable region having at least two side edges, and having a gas flow passage formed within it, said gas flow passage defining a first axis; said gas inlet throat having two side edges, said gas inlet throat defining a second

axis, the gas inlet throat extending from a corner defined by the junction of said two side edges of the inflatable region, the method comprising the step of re-positioning the gas inlet throat from a first condition in which the axis defined by said gas inlet throat is inclined relative to the axis defined by the gas flow passage to a second condition in which the axis defined by the gas inlet throat is aligned with the axis defined by the gas flow passage, thereby forming a gusset of excess material, said gusset being located adjacent the junction of one of said side edges of the gas inlet throat and one of said side edges of the inflatable region.

12. A method of processing an air-bag according to Claim 11, further comprising the step of concertina-folding the inflatable region.

13. A method of processing an air-bag according to Claim 12, wherein the concertina folds are parallel to the axis defined by the gas flow passage of the inflatable region.

14. A method of processing an air-bag according to any one of Claims 11 to 13, the method further comprising the step of encasing the air-bag in a sleeve or housing.

15. A method of processing an air-bag according to Claim 14, further comprising the step of locating parts of the air-bag to extend through apertures formed in the sleeve or housing such that said parts protrude from the sleeve or housing.

16. A method of processing an air-bag according to any one of Claims 11 to 15 further comprising the step of connecting the gas inlet throat to a gas generator.

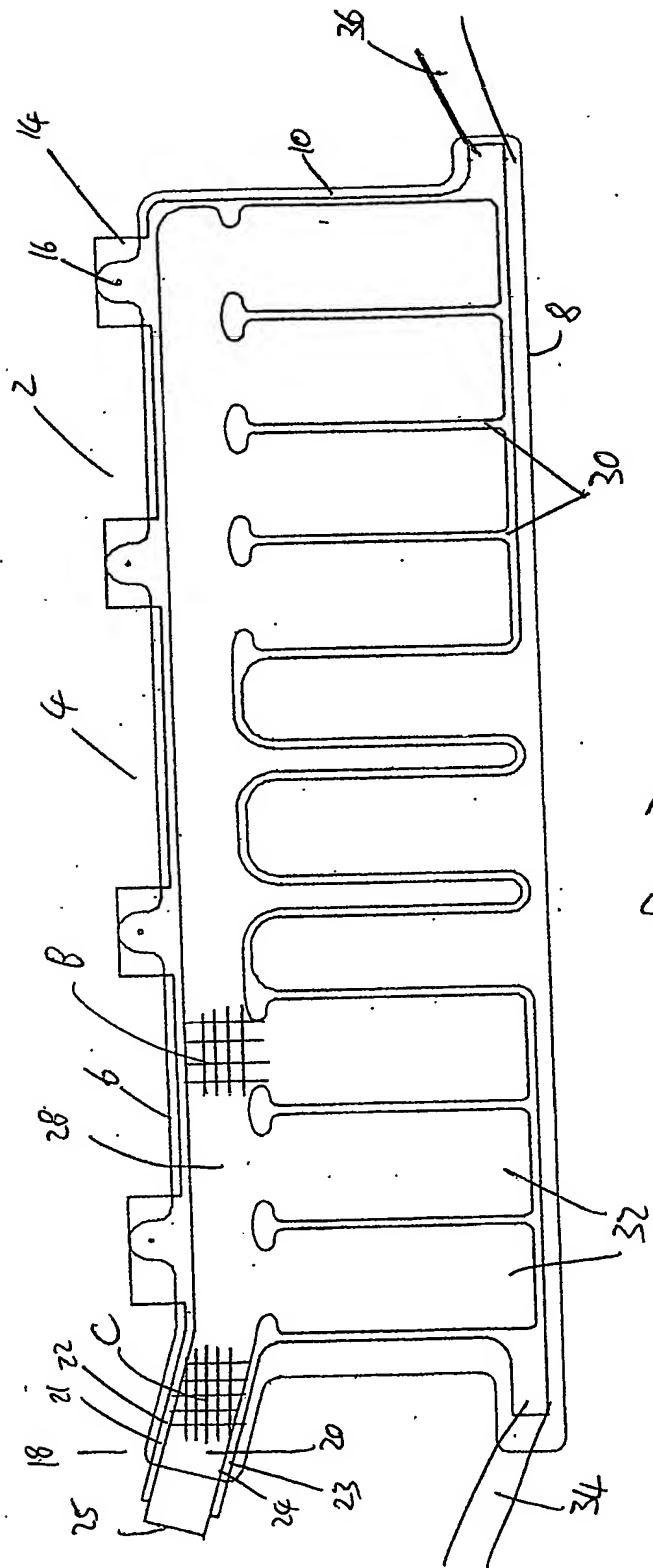
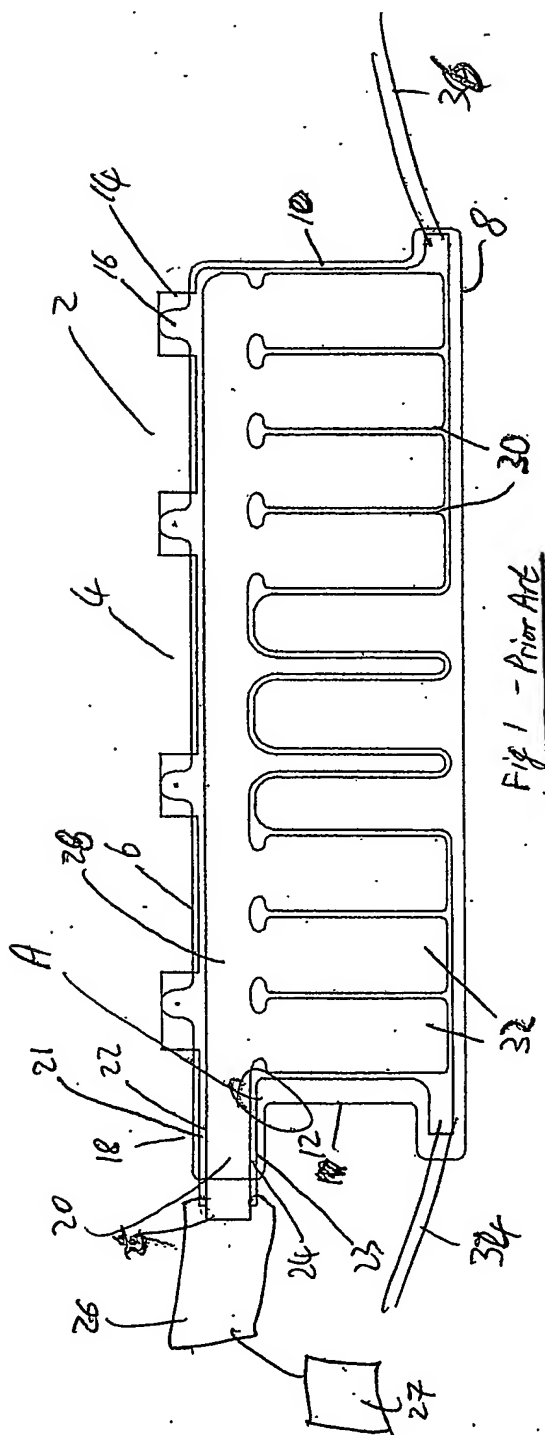
17. An air-bag substantially as herein described with reference to and as shown in figures 2 to 4 of the accompanying drawings.

18. A method of processing an air-bag substantially as herein described with reference to and as shown in Figures 2 to 4 of the accompanying drawings.

19. Any novel feature or combination of features disclosed herein.

ABSTRACT**"IMPROVEMENTS IN OR RELATING TO AN AIR-BAG"**

An air-bag (2) comprising an inflatable element having an inflatable region (4) and a gas inlet throat (20) extending from the inflatable region, a gusset (38) of excess fabric being present in the region proximate to the junction between the gas inlet throat and the inflatable region.



2/3

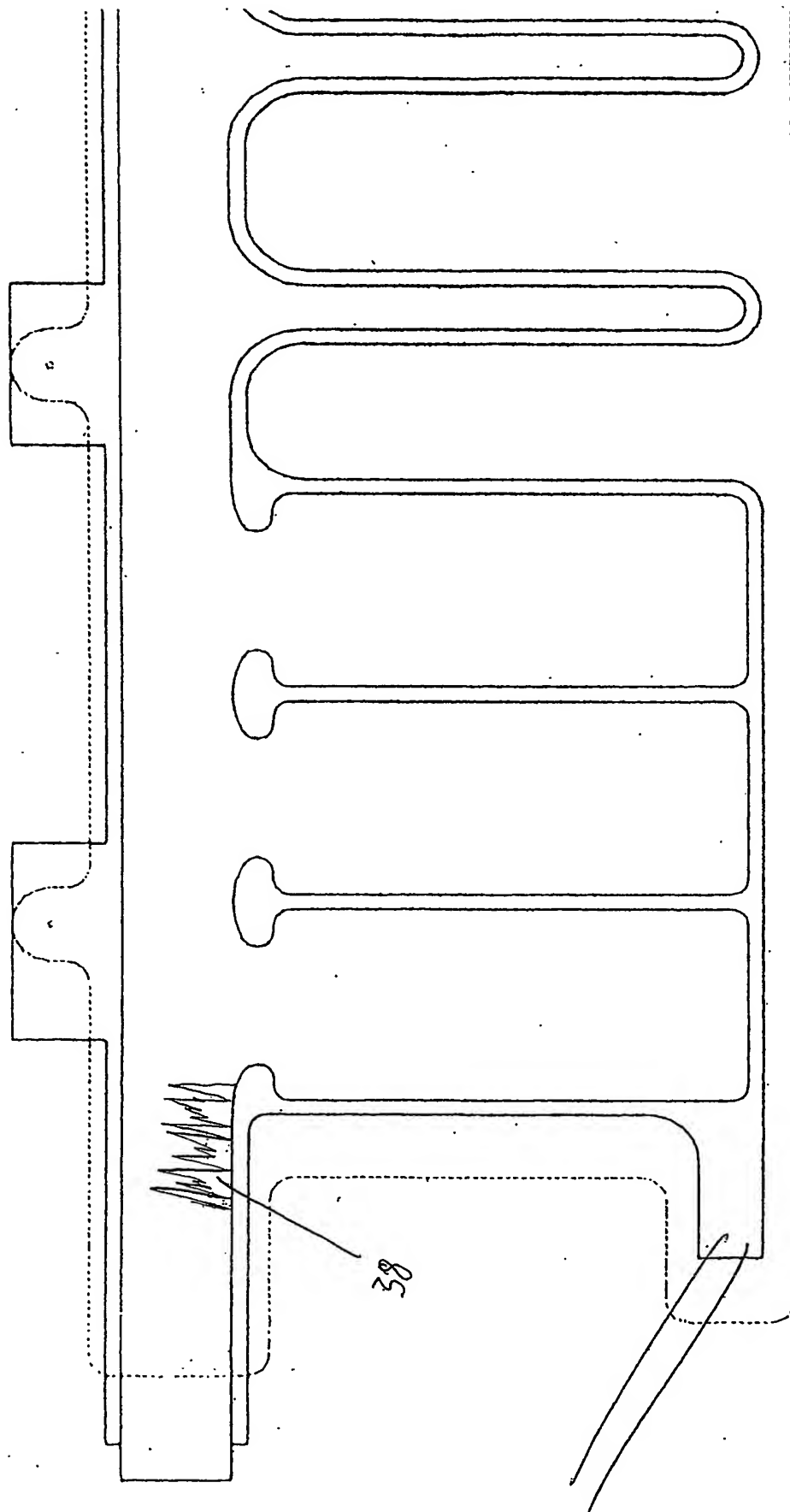


Fig 3

3/3

